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Short communication

## The association of behavioural and emotional problems with tobacco use in adolescence

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### Abstract

Smoking is a highly addictive behaviour, often initiated during adolescence. It is suggested that smoking is associated with behavioural and emotional problems. This study aims to assess the impact of psychosocial problems on smoking initiation and vice versa.

*Method:* We obtained data on self-reported psychosocial problems and smoking of adolescents at the age of 13 years and 2 years later. The baseline questionnaire was completed by 1789 students. 68% of the baseline questionnaire could be linked to a questionnaire of the second measurement.

*Results:* 15% smoked at baseline and 29% two years later. Respectively 8% and 9% had a clinical Externalizing problem score or a clinical Internalizing problem score at baseline, 14% had these problems two years later. Externalizing problems at baseline predicted the onset of smoking two years later. Internalizing problems only predicted smoking among girls. This association between psychosocial problems and smoking is most obvious for the onset of regularly smoking and less for the onset of experimenting. Reversibly smoking at baseline is only associated with the onset of externalizing problems two years later.

*Conclusion:* Clinical Externalizing and Internalizing problems make the initiation of regular smoking more likely. The effects on experimental smoking are less obvious.

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*Keywords:* Smoking; Adolescents; Emotional and behavioural problems

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## 1. Introduction

Smoking is a highly addictive behaviour, often initiated during adolescence. It is suggested that smoking is associated with problems, like depression, anxiety and behavioural problems (Laukkanen, Shemeikka, Notkola, Koivumaa-Honkanen, & Nissinen, 2001; Liu, 2003; Patton et al., 1998). This association could develop in two ways: either unhealthy behaviour, such as smoking, results from the emotional and behavioural state of adolescents or smoking is a predictor of psychosocial problems. Conclusive evidence on the causal direction is not yet available. The aim of this study is therefore to assess how emotional and behavioural problems are associated with smoking behaviour in adolescence.

## 2. Methods

### 2.1. Study population

We obtained data on self-reported psychosocial problems and smoking of adolescents in secondary schools at the age of 13 years and 2 years later. Data were obtained as part of a quasi-experimental study on the effects of a school health promotion programme that aimed to prevent psychosocial problems, smoking initiation, and excessive use of alcohol in secondary schools. There was no significant effect of this programme (Crone, Reijneveld, Hegger, & Paulussen, 2005).

### 2.2. Measures and data collection

Baseline measurements had been performed in all grade 2 classes of two intervention schools and two control schools, and in all grade 1 classes of one intervention and one control school, in October 1999. Baseline measurements consisted of completing a questionnaire during their regular classes. Students completed the same questionnaire in May 2001 (Reijneveld, Crone, Verhulst, & Verloove-Vanhorick, 2003).

*Behavioural and emotional problems* were measured by the Youth Self-Report (YSR) (Achenbach, 1991). Its (good) reliability and validity have been replicated for the Dutch translation (Verhulst, van der Ende, & Koot, 1997). Of the YSR we computed scores for Internalizing and Externalizing problems, and a Total Problems score. Adolescents were allocated to a normal range or a clinical range, using the 90th percentile of the Dutch normative sample as cut-off (Verhulst et al., 1997).

*Smoking behaviour.* For the analyses smoking was categorised in two variables: 1) smoking one cigarette a month or more versus non-smoking and 2) regular smoker (at least once a week), experimental smoker (approximately once a month or less), and non-smoker or quitter.

We further obtained data on gender, age, level of education (lower/higher), ethnic background (both parents born in the Netherlands/else), religion (Christian/other/none), and parental employment (one or both parents working >3 days per week/else).

Measurements were anonymous and could only be linked by using school code, gender, date of birth and initials of the adolescent.

### 2.3. Analysis

We assessed the association in time between smoking and emotional and behavioural problems, both crude and with adjustment for background variables. First, we conducted these analyses among

non-smoking students at baseline to assess the relation of baseline psychosocial problems with smoking onset during the subsequent two years. Next, we assessed the influence of baseline smoking on having emotional or behavioural problems two years later in the group of students with no clinical score on these problems at baseline. A difference was statistically significant when  $p < 0.05$ .

The initial analyses were effectuated with multilevel logistic regression. The random variances on school level, on class level and on student level were not significant; meaning that in this study smoking behaviour of students is not clustered within a school or a class.

Table 1  
Background variables

		%n, n = 1220
Education level	Lower education	54.3
	Higher education	45.7
Religion	Christian	18.3
	Other religion	11.8
	No religion	69.9
Origin	Dutch	89.0
	Non-Dutch	11.0
Age at baseline	10 to 13 years old	19.8
	13 years old	57.0
	14 years old	23.3
Work situation	No fulltime job in household	12.9
	At least one fulltime job	87.1
Education mother	Unknown	26.1
	Lower education	33.3
	Average or higher education	40.6
Education father	Unknown	26.9
	Lower education	25.5
	Average or higher education	47.6
Gender	Boy	48.1
	Girl	51.9
Smoking at baseline	Non smoker	81.8
	Quitting stage	3.2
	Experimental stage	6.1
	Regular stage	8.9
Smoking two years later	Non smoker	67.7
	Quitting stage	2.9
	Experimental stage	9.0
	Regular stage	20.4
Externalizing problems at baseline	Normal	91.7
	Clinical	8.3
Externalizing problems two years later	Normal	86.5
	Clinical	13.5
Internalizing problems at baseline	Normal	90.8
	Clinical	9.2
Internalizing problems two years later	Normal	86.0
	Clinical	14.0

### 3. Results

*Response.* 1789 students completed the baseline questionnaire. In total 1220 (68%) could be linked to a questionnaire of the second measurement; 73 questionnaires were not fully filled out. The non-responders more often had a lower education, had no parents with a fulltime job, came from a non-Dutch origin and smoked more often at baseline than the responders (Crone et al., 2005).

#### 3.1. Prevalence rates

Fifteen percent of the students smoked at baseline and 29% two years later. Eight percent had a clinical Externalizing problems score and 9% had a clinical Internalizing problems score at baseline compared to 14% and 14% two years later (Table 1). At baseline, students with a lower education and older students smoked more often compared to students with a higher education and younger students. This had not changed after two years. At baseline, prevalence rates of Externalizing and Internalizing problems did not differ by background variables. However, after two years girls (16%) more often had Internalizing problems than boys (11%).

#### 3.2. Behavioural and emotional problems predicting smoking initiation

Both a clinical YSR Total problems score and a clinical score on Externalizing problems at baseline were associated with the onset of smoking two years later. A clinical score on Internalizing problems was not associated with smoking two years later (Table 2). Gender, however, modified the effect of Internalizing problems on smoking initiation. Girls having Internalizing problems at baseline had started smoking significantly more often than girls with no such problems (OR=2.52, 95%-CI=1.30–4.91), whereas no association was found for boys.

We repeated the analyses for two subgroups of smokers, experimental and regular smokers, comparing both of them with non-smokers. Non-smoking students with a clinical Total, Externalizing or

Table 2

The association between a clinical YSR Problem score at baseline and smoking 2 years later, among initial non-smokers ( $n=1013$ )

	% $n$ smoking 2 years later	Being a smoker 2 years later Unadjusted OR (95%-CI)	Being a smoker 2 years later Adjusted OR (95%-CI) <sup>a</sup>
Total problems			
Normal	20	1	1
Clinical	38	2.42 (1.51–3.89)	2.37 (1.47–3.81)
Externalizing problems			
Normal	20	1	1
Clinical	40	2.56 (1.48–4.44)	2.58 (1.49–4.48)
Internalizing problems			
No	21	1	1
Clinical	28	1.49 (0.91–2.45)	1.49 (0.90–2.45)

<sup>a</sup> Adjusted for background variables gender and school level.

Table 3

The association between a clinical YSR Problem score at baseline and being an experimental smoker or a regular smoker 2 years later (versus being a non-smoker), among initial non-smokers ( $n=1013$ )

	Prevalence of experimental smokers 2 years later (%)	Experimental smoker 2 years later Adjusted OR (95%-CI) <sup>a</sup>	Prevalence of regular smoker 2 years later (%)	Regular smoker 2 years later Adjusted OR (95%-CI) <sup>a</sup>
Total problems				
Normal	9	1	11	1
Clinical	11	1.66 (0.79–3.52)	27	2.97 (1.72–5.13)
Externalizing problems				
Normal	9	1	12	1
Clinical	14	2.03 (0.91–4.53)	26	2.94 (1.54–5.60)
Internalizing problems				
No	9	1	12	1
Clinical	7	0.94 (0.39–2.25)	21	2.00 (1.13–3.56)

<sup>a</sup> Adjusted for background variables gender and school level.

Internalizing problems score at baseline had odds ratios of 2.97 (95%-CI=1.72–5.13), 2.94 (95%-CI=1.54–5.60) and 2.00 (95%-CI=1.13–3.56) respectively for being regular smokers two years later compared to baseline non-smoking students with no clinical score on one of these problems (Table 3). There was no association with being an experimental smoker two years later.

### 3.3. Smoking predicting the onset of behavioural and emotional problems

Smokers at baseline (with no clinical score on Externalizing problems at baseline) were more likely to have a clinical Externalizing problems score two years later than non-smokers (20% versus 9%, OR=2.41; 95%-CI=1.48–3.91). Gender did not modify the effect of smoking on behavioural and emotional problems. Regular smoking students were more likely to have a clinical score on Externalizing problems two years later (OR 2.91; 95%-CI=1.61–5.23) than non-smoking students. No significant differences were found between experimental smokers and non-smokers.

That smoking predicts a clinical Externalizing problem score could also be an indication of at baseline a higher Externalizing problems score, though not yet clinical, among these baseline smokers. Analyses indeed showed that these baseline smokers had significantly higher Externalizing problems scores at baseline than non-smokers (11.37 and 9.11 respectively;  $F=31.11$ ,  $p<0.0001$ ).

## 4. Conclusions

Our results indicate that in particular externalizing problems at the age of 13 predict the onset of smoking two years later. Internalizing problems only predicts smoking among girls. This predictive value is most obvious for initially non-smoking students who have become regular smokers two years later and is less obvious for students who have become experimental smokers. Reversibly, regular smoking is only associated with the onset of externalizing problems.

#### 4.1. Methodological considerations

A limitation of our study is that it relies on self-report. Answers, however, were confidential and anonymous, which has been shown to lead to valid self-reported information on adolescent smoking (Rebagliato, 2002; Stanton, McClelland, Elwood, Ferry, & Silva, 1996), and on mental health (Boyle et al., 1997).

Another limitation was the loss-to-follow-up. Non-responders mainly consisted of immigrants, students with a lower education, smokers and students having parents without a job. This may have led to an underestimation of the effect of smoking on psychosocial problems, while in particular adolescents with these characteristics are more likely to smoke and to have psychosocial problems (De Vries, 1995; Reijneveld, Brugman, Verhulst, & Verloove-Vanhorick, 2005; Reijneveld, Harland, Brugman, Verhulst, & Verloove-Vanhorick, 2005).

#### 4.2. Fit with literature

Patton et al. (1998) found that internalizing problems predicted the initiation of experimental smoking. In this study no relation was found between internalizing problems and the initiation of experimental smoking, only with regular smoking.

That smoking predicts externalizing problems and vice versa suggests that regular smoking and externalizing problems are both expressions of the same behaviour. The effect of externalizing problems on smoking behaviour is the strongest, though. Smoking is therefore more likely to be an indication of increasing behavioural problems, which is confirmed by the finding that baseline smokers already have a higher (not clinical) score on externalizing problems than non-smokers.

Audrain-McGovern et al. (2004) found that earlier or faster smoking adopters were characterised by their high novelty seeking personality, more depressive symptoms, poorer academic performance, and higher receptivity to tobacco advertising, as well as a higher exposure to other smokers, and users of other substances. Our study confirms some of their findings as we found that only regular smoking and not experimental smoking is related to psychosocial problems.

The fact that regular smoking is related to a clinical score on Externalizing and Internalizing problems also supports the hypothesis that smokers might use nicotine as self-medication for their mental disorders. Clinical features of these disorders may be remediated by nicotine administration or smoking (Sacco, Bannon, & George, 2004).

#### 4.3. Implications

Our findings imply that health messages or smoking cessation programs should take into account the heterogeneity of adolescents and differ their programs for regular and experimental smokers. They also indicate that the self-medication hypothesis of smoking among adolescents with psychosocial problems deserves further study.

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